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## MODULAR ADVANCED FUZE INTERFACE ARCHITECTURE (MAFIA) BRIEFING CHARTS

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### CONFERENCE BRIEFING CHARTS

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# Modular Advanced Fuze Interface Architecture (MAFIA)

52<sup>nd</sup> NDIA Fuze Conference  
Sparks, NV  
14 May 2008

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# Outline

- Purpose
- What This Is Not
- Fuze Architectures & DoD Acquisition
  - Current Approach
  - Modular, Open Systems
- Why This Program?  
Why Now?
- Distributed Fuzing
  - Perceived Benefits
  - Arguments Against
- Lessons Learned
- MAFIA Approach
- Summary
- Questions



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# Purpose

- Stimulate Dialogue
  - Within Fuzing and Ordnance Communities
  - Diametric Shift in Systems Engineering
- Establish That Distributed Fuzing Can:
  - Provide Benefits Worth Having
  - Be Compatible with System Safety
- Encourage Community To Explore and Implement Distributed Fuzing For Safe, Viable Systems
  - Via Discussions/Ad-Hoc Working Groups



# What This Effort Is Not:

- Erosion Of Any Safety Function Via:
  - “Standardization”
  - Interchangeable “Fuzes”
  - Interchangeable Modules (Unlimited “Mix-N-Match”)
  - Forced Functional Distribution
  - Unchecked Growth (To Include Technology)
  - Unverifiable Dependence





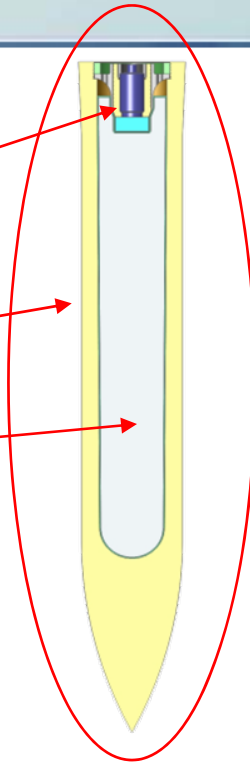
# Current Fuze Architecture

## Legacy Systems

- Fuze
- Warhead
- Explosive

## Acquisition & Architecture

- Fuzes An Afterthought
- Fuzes Are Separate Acquisition Items
  - “Commodities”



## Fuzing System Responsibilities

- Safety
- Arming
- Sensing & Target ID
- Explosive Initiation
- Communications

## Most Functions Are Co-Located Within Fuze “Can”

- Legacy Weapon Fuzes Are Separate Components
  - Stored Separately
- Imposes Capability Constraints



# DoD Acquisition Preference

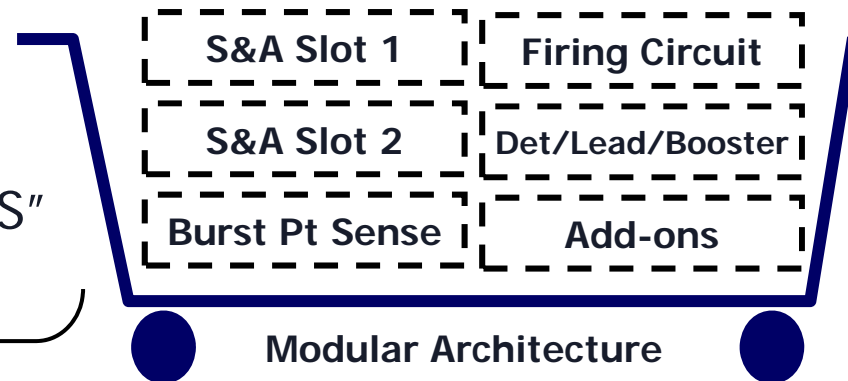
## **MOSA:** Modular Open Systems Approach

- Integrated Business & Technical Strategy
- Preferred By DoD Acquisition Policy

## **Intent: Faster, Lower Cost Development, Integration**

- Predicted Improvement In “-ilities”
  - Affordability, Reliability, Etc.
- Piecewise Capability Development
  - Incremental Acquisition Strategy
  - “Plug & Play” Compliant Systems
  - Multiple Subs For Multiple Modules
  - Modular Capabilities Become “COTS”
  - Service & Contractor Mix-N-Match

Good Topics for  
Working Group Discussion







# Why This Program? Why Now?

- Fuze "Commodity" Approach
  - Imposes Constraints
  - Lost Intended Benefits
- Available Technologies Do Make A Difference
  - Less Sensitive Booster Materials
  - Mission Programmability
  - Post-Impact Survivability & Functionality
- Fuzes Are Getting Squeezed
  - Smaller Weapon Systems
  - Parts (Electronic) Obsolescence
  - Disproportionate Cost Focus
- Why not?
  - Challenge Traditional Thinking
  - Perhaps This (Modularization) Is The Way To Go
  - Somebody's Got To Try It!
- What Is The Larger Picture?
  - What About Readiness?
  - Easier To Develop/Mature Pieces Than The Sum Total
  - Pro-Active Involvement Means Having A Say In How It Is Accomplished



# Perceived Benefits of Distributed Fuzing

- Allow Target Detection Device (TDD) To Remain With Warhead
  - Nose Fuzing (TDD) Is Desirable For Penetrator Applications
    - Liberation From Tail Slap
    - Reduce TDD Sensor Latency
    - Eliminate Traditional "Fuze Well"
    - Exploit Energetic Rebound (and Not Be A Victim of It!)
- Facilitates Standardized Communication
  - Launch Platform to Weapon
  - Weapon to Fuze
  - Fuze to Module



# Perceived Benefits of Distributed Fuzing

- Smaller Functional Modules Could:
  - Support Trend Towards Smaller Weapons
  - Allow Diverse Placement Within Weapon Systems
    - Example: Redundant Fuzing
  - Allow For Multiple Sourcing (Procurement)
  - Reduce Acquisition Cycle
    - Developmental Testing According To Need
    - Qualify/Re-Qualify According To Need
    - Support/Instrumentation Demands Reduced
  - Commit To Physical Segregation Between Safety & Non-Safety Functions
  - Allow For Trending In Mature Design (Over Time)



# Arguments Against Distributed Fuzing

- No Legacy Business Case
  - Large Inventory Of Legacy Weapons
  - Significant Investment Within Inventory Unitary Fuzes
- No Prime/Sub Contractor Incentives For New Systems
  - Use “Off-The-Shelf” Fuzes
  - Regurgitate All or Part of Existing Designs
- Requires Significant Up-Front Investment
  - Personnel & Program Funds
  - No Obvious Short Term “ROI”
- Establishing Joint Rules Challenging/Time-Consuming
  - Requirements Document(s)
  - Safety
  - Systems/Subsystems Interface
  - Environments
  - Test/Verification
  - Post Mission Features



# Lessons Learned

Society Of Automotive Engineers (SAE)

Fuze Standardization Working Group (AS1-B6)

- **Intent:** Standardize Air-Delivered Ordnance Fuzing
- Met Quarterly Over Approximately Three Years
- Group Consisted Of:
  - Foreign and Domestic
  - Government (Tri-Service) and Contractors
- Second Group Formed (AS1-B7) To Address Mechanical Standardization Such As Fuze Well



# Lessons Learned

- Group Struggled With What To “Standardize”
  - “Fuze” Verses “Fuzing System”
  - Continued Push For Subsystem Interchangeability Before System Interoperability Established
  - Contractor Influence Not Always Constructive
  - Non-Fuze Influence Not Constructive
    - SAE Limitations
    - Specialty Attitude That “Only \_\_\_\_ Can Solve Everything Right”
  - ITAR/Foreign Dialogue Limited (UAI Not Discussed)
  - Effort To Accommodate Legacy Systems “Ball-&-Chain”
  - Perception of Constant Safety “Adult Supervision”





# MAFIA Approach

- Design/Promote A Modular Fuze Architecture By:
  - Parsing Fuzing System Functional Allocations
    - Communication
    - Safety
    - Target Detection Device (TDD)
  - Determining/Defining Interfaces
    - Interface Control Document (ICD) Style
    - Establish Rules/Conditions That Can Allow “Plug & Play” Functionality
  - Determine Certification, Conformance, Metrics
  - Set Minimum Qualifications To Satisfy Requirements
  - Support Legacy Weapon Systems (As Reasonable)



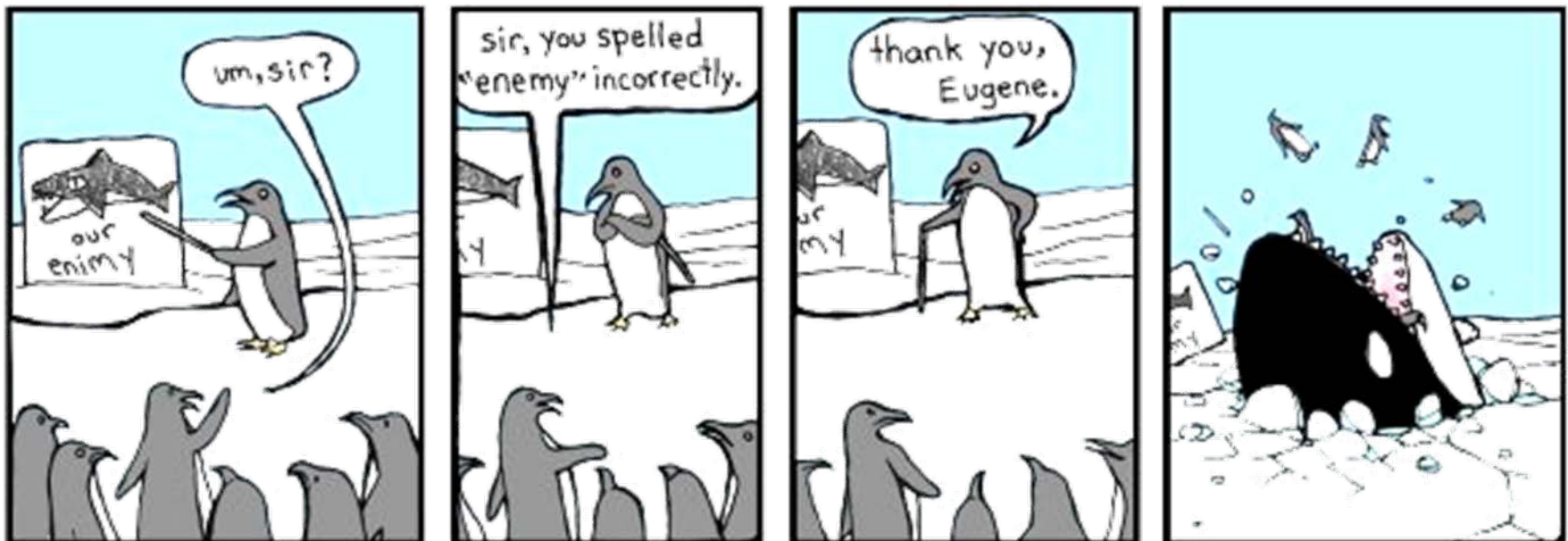
# MAFIA Status

- Unfunded program (for now)
  - Related Air Force Program Slated To Begin In FY10
- Beginning Socialization and Groundwork
  - Government Advocacy
    - DoD Fuze IPT
  - Other Fuze Communities (Technical & Acquisition)
    - DoE-DoD Technical Coordinating Groups (TCG's)
    - Fuze Engineering Standardization Working Group (FESWG)
  - Support Is Welcome Now



# Summary

- Modular Fuzes Can Provide Significant Technical & Acquisition Advantages
  - Decentralized Location
  - Incremental Acquisition
  - Technology Improvements
- Legacy Fuze Approach
  - Imposes Constraints On System Performance
  - “Way It’s Always Been Done”
- Ramping Program Up Now
  - Long Road Ahead

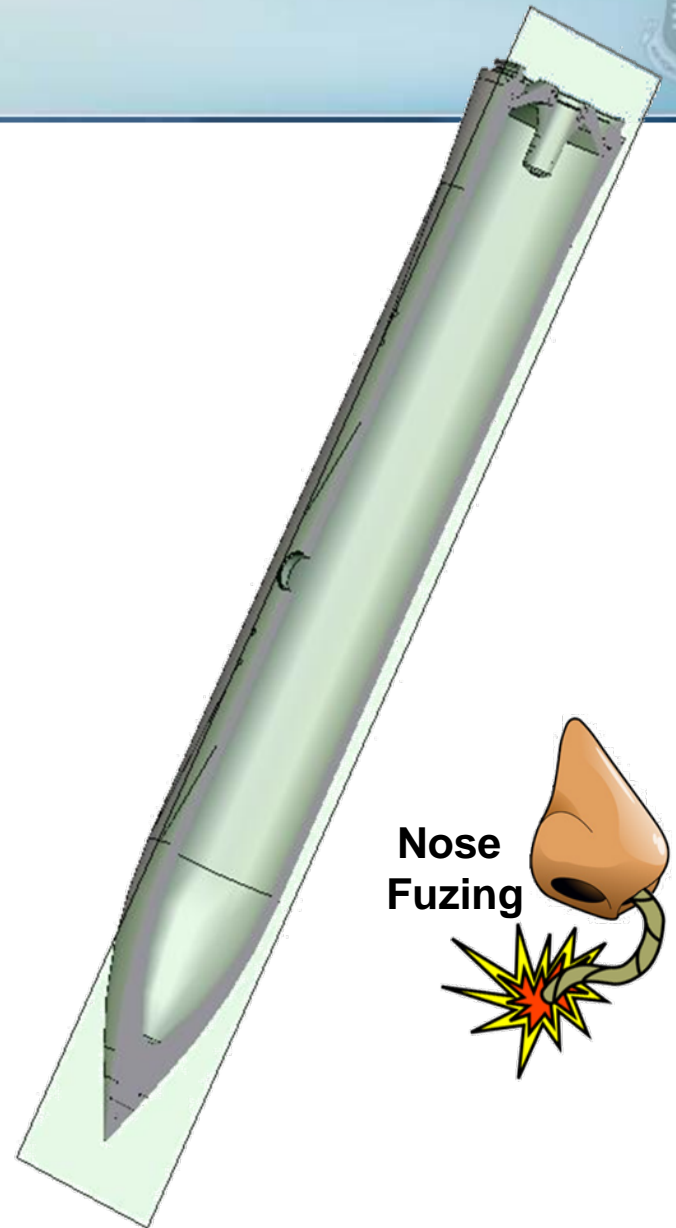




# Questions?

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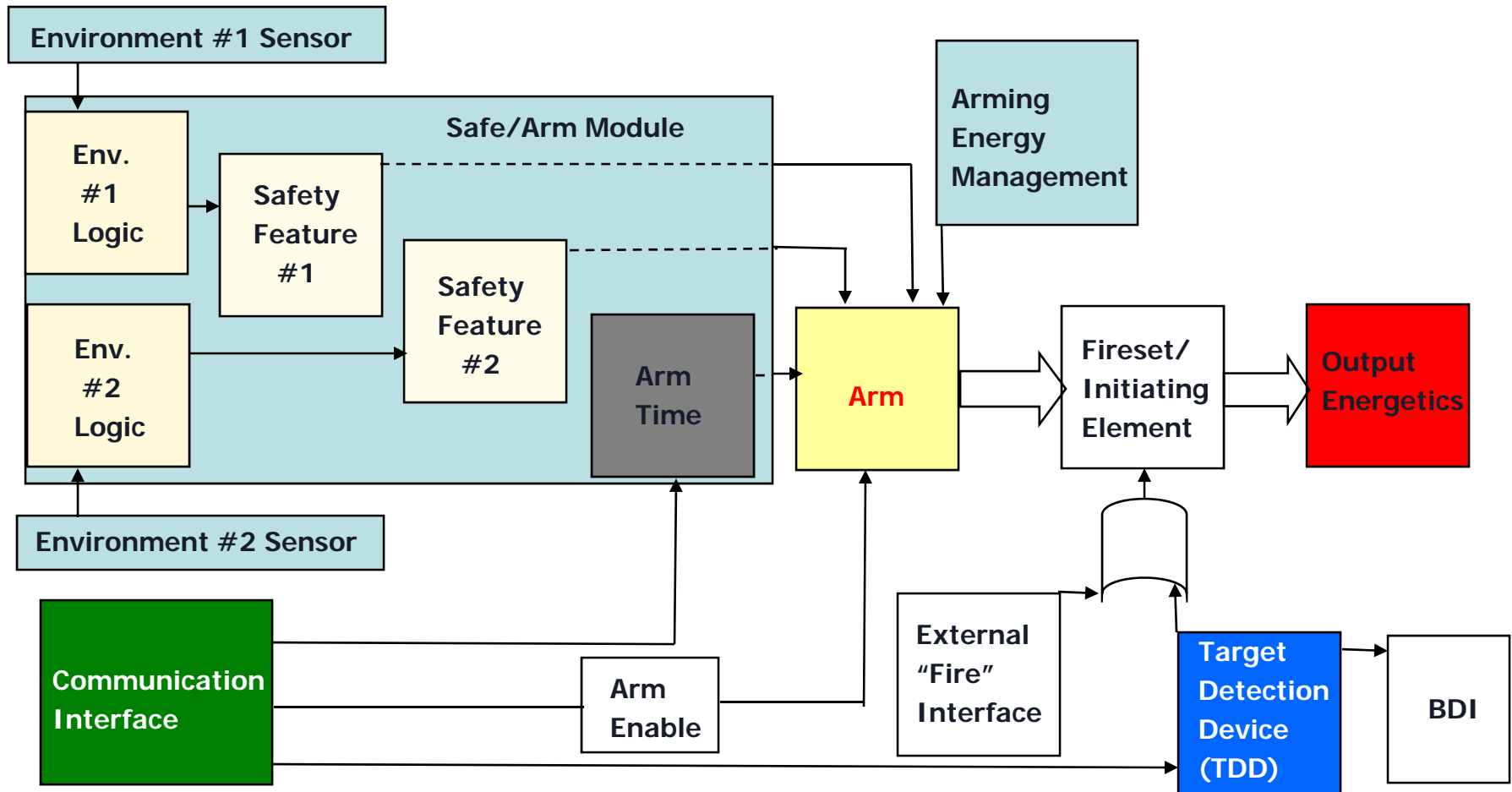


# Backup Slides





# Notional Fuzing System Block Diagram







# Parsing Example, Fuzing Program Data

